

## Application note AN526

### Task

Supervision of two speed applications

### Description

Supervision of applications where normal operation is performed at two different rpm (speeds).

Note: Supervision is disabled during speed change.

### Unipower

For this task the Unipower HPL500 is used.

### Setup

HPL500 may be setup especially for two speed applications where only one limit is active at the time selected by the external input S2.

**S2 Select** (Parameter P14) is set to [SPC]. Now the input S2 will determine the active limit (S2 ON = limit 1, S2 Off = limit 2). This also enables separate current range for each limit.

In this application note it is assumed that the high speed (high power consumption) is selected for limit 1. This is not mandatory but may be selected freely by the user. Settings and considerations must then be suited the opposite situation.

**Voltage Range** must be set to the nominal voltage for the motor(s).

**Current range 1** should be selected so that the rated motor current for the high speed is covered. This poses two scenarios:

- a) Current < 40A – i.e. the internal CT is sufficient
- b) Current > 40A – i.e. an external N/5 CT is needed

a) Simply select the current range needed to cover the rated motor current.

b) When using an external CT chose the smallest CT big enough to cover the rated motor current and select 5A range for limit 1. This provides the measuring circuit with the best resolution. Although the kW reading on the unit will not show the actual power consumption the kW% value (used for supervision) reflects the actual load.

**Current range 2** must be selected so that the rated motor current for the low speed is covered. Depending on the scenario for setting up current range 1, there also are two scenarios for setting up current range 2:

- a) Select the current range needed to cover the rated motor current for low speed.
- b) Scale down the current range to the smallest range big enough to cover the output current from the external CT at low speed. This is illustrated with an example:

An external CT of 75/5A is used and the current at low speed is 22A.

The output current of the CT at low speed will be:  $22A / 75A * 5A = 1.47A$

The smallest range big enough to cover 1.47A is 2.5A, so the current range for limit 2 should be set to 2.5A.

**Start timer** (Ts) must be set large enough to filter out the start up current for the motor for both speeds. If set too small, an alarm will occur at start up. If set too large, damage to equipment might occur if an alarm condition is present at start up. So please set Ts just large enough for the motor to be at nominal speed when Ts expires.

**Note:** Selecting a new active limit via S2 will enable Ts so that every speed change disables supervision.

**Setpoints** could be set using the peak detectors; Leave the motor running at maximum acceptable load and read the max-peak. The setpoint should be assigned a value appropriately above. This procedure is applicable for both speeds.

**Respons timers** must be set according to the need for intervention due to overload. Typically values below 0.5 seconds are applicable for overload protection, but an exact value can not be given here.

## Mode of operation

The status of S2 determines the active limit. Each time S2 changes status a start timer will be enabled as soon as the measured power consumption exceeds 5%.

Should an overload occur the generated alarm may be reset independently of the active limit; i.e. a limit 1 alarm may be reset also if limit 2 is active.

## Connection

The schematic below shows how the HPL500 may be connected to solve the task. It is important that the input S2 (terminal 16) is connected so that it is closed (gnd) when high speed is running and open when low speed is running.

If the HPL500 is connected before the speed selector switch for the motor a more simple connection may be made regarding the current measurement as shown below.

In the example the two output relays are connected in series to produce only one signal for alarm for both speeds. If it is required to be able to distinguish between an overload for each speed, the relays must be connected to separate inputs in the controller circuit.

Please note that the example shows high and low speed on separate motors. The application might just as well have been solved with a Dahlander motor, but for drawing simplicity the two motor solution is shown.

